KELLOGG SWITCHBOARD AND SUPPLY COMPANY

A Division of International Telephone & Telegraph Corporation

Chicago, Illinois

Kellogg Booklet 5408

1954

Kellogg Transmitted No.5 Carrier

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Also of note is the Kellogg/ITT logo which was used only for a few years before ITT dropped the Kellogg name.

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KELLOGG

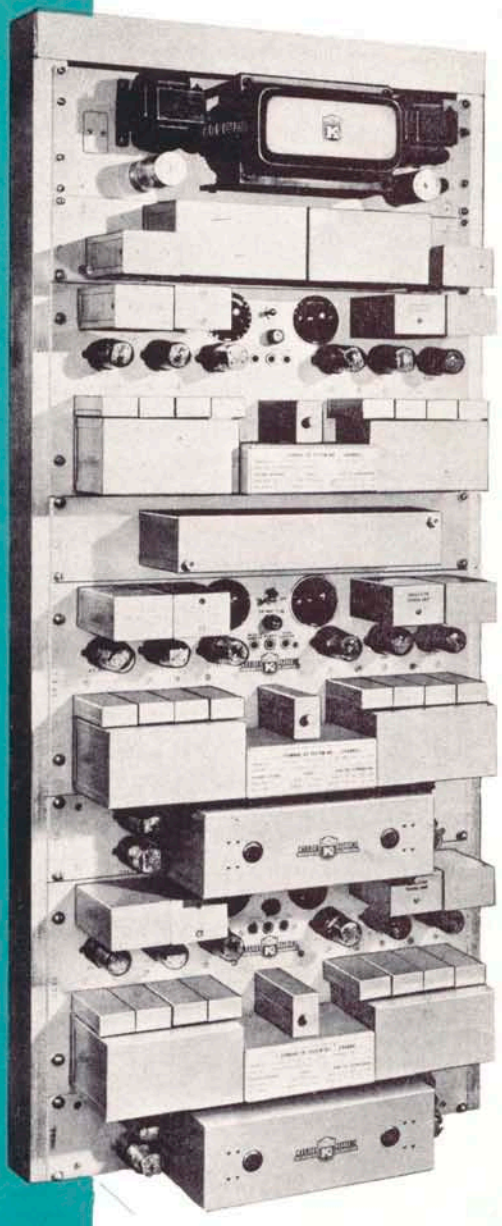
Transmitted NO. 5 CARRIER

GIVES YOU

1, 2 OR 3

ADDITIONAL CIRCUITS PER LINE
WITHOUT NEW CONSTRUCTION

Easy TO INSTALL
OPERATE
MAINTAIN



positive foolproof signalling!

KELLOGG DIVISION OF IT&T **SWITCHBOARD AND SUPPLY COMPANY**

A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

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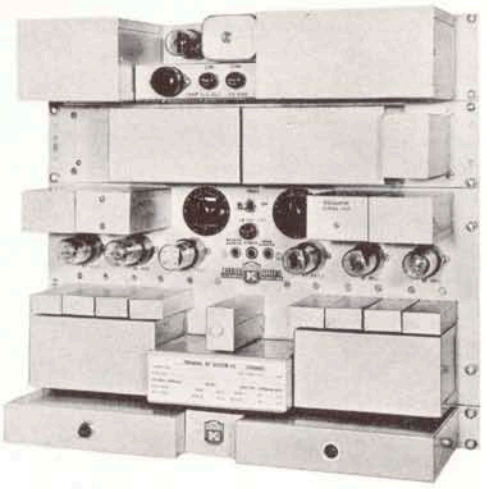


TYPICAL CHANNEL UNIT

WHAT IS A CARRIER SYSTEM?

Carrier systems consist of equipment designed to provide additional talking and signalling circuits over existing telephone lines without the addition of any outside plant equipment. Commercial quality voice frequency channels require a band of frequencies from 300 to 3000 cycles. Since most wire circuits are capable of transmitting much higher frequencies, bands of frequencies above 3000 cycles are used in carrier equipment to create additional voice channels. Kellogg No. 5 Transmitted Carrier Systems provide up to 3 additional talking and signalling circuits or a total of 4 circuits without adding to outside plant equipment.

WHAT IS A *Transmitted* CARRIER SYSTEM?

In a *transmitted* carrier system the carrier frequency generated by the oscillator in each channel is actually transmitted on the line. Most carrier systems suppress or filter out this oscillator frequency and transmit only the sum or difference of the oscillator frequency and the voice frequency. The use of the principle of *transmitting* rather than suppressing the oscillator or carrier frequency has many avantages, a few of which are explained in the following paragraphs.

ADVANTAGES OF KELLOGG *Transmitted* CARRIER

■ No Synchronization Necessary . . . *Transmitted* Carrier Systems do not require separate oscillators in the receiving section of the carrier terminal, as each sideband is demodulated by the same carrier frequency which originally produced it. *Thus there is no requirement for synchronizing or aligning oscillator frequency at any time.*

■ No Frequency Distortion . . . Since voice frequencies cannot be shifted by a difference in oscillator frequencies, *Transmitted Carrier Systems are completely and continuously free of voice distortion due to frequency shift and speech is always clear and distinct.*

■ No Carrier Leak Adjustments . . . Carrier leak is not a problem in Kellogg Transmitted Carrier Systems and *no adjustments for eliminating or minimizing carrier leak are required.*

■ Simplified Positive Signalling . . . In ringdown service, ringing is accomplished simply by blocking the transmitted carrier frequency during the ringing period. In dial service, the transmitted carrier is shifted, using a frequency modulated signal unit. Signalling in both services may be accomplished over lines having attenuation values in *excess* of the allowable limits for the carrier *talking circuit. Thus, signalling is always positive and foolproof.*

Also, signalling is accomplished within the limits of the transmitted side band and no additional frequency bands are required.

■ Installation, Operation and Maintenance Simplified . . . Since no adjustment of oscillator frequencies or carrier leak is required, Kellogg *Transmitted* Carrier Systems can be installed and placed in service in a very minimum of time. Because the carrier frequency is transmitted, measurements of terminal output and of the level of the carrier frequency received from the distant terminal may be easily and quickly made with a vacuum tube voltmeter without the use of a separate oscillator.

WHAT A KELLOGG *Transmitted* CARRIER SYSTEM WILL DO FOR YOU

Save Construction Costs By providing additional channels for voice transmission, it multiplies your facilities, *with no need for new construction.* This means a real saving, considering the cost of new copper line wire, insulators and pole hardware, plus the cost of installation.

Improve Transmission Quality Carrier talking circuits are free from disturbing noise that is frequently present on physical circuits because noise outside the carrier frequency band is filtered out. Thus powerline harmonics and similar disturbances which may be present on the line at frequencies outside the voice band are removed from the carrier talking circuit.

Boost Earnings Handle Emergencies and Heavy Seasonal Traffic—During holiday rush periods, or when emergencies arise, you can multiply line capacity by putting one, two, or three carrier channels on the circuit. Then you'll see how a Carrier can boost toll revenue! It does this by providing facilities for more traffic, thus eliminating cancellations caused by busy reports.

KELLOGG DESIGN AND PERFORMANCE FEATURES

Equal Performance on all 3 Channels — Kellogg *Transmitted* Carrier Systems are designed to give approximately equal performance in all three channels on a given wire circuit. Since the attenuation of a wire circuit increases with frequency, the terminal loop gain of the second and third channels has been increased above that of the first channel by approximately 11 db. This means that on the average wire circuit, a second and third channel Carrier System can be installed above an existing first channel and give equally good performance without the addition of separate channel amplifiers or carrier repeaters *even though the first channel may be working near its upper limit.*

To give a commercial 6 db circuit, the first channel will operate over a line attenuation of 30 db measured at 10 KC and the second and third channels over a line attenuation of 41 db measured at 20 KC and 30 KC respectively. These figures can be translated into circuit miles of various wire and cable facilities using the attenuation table shown below. Transmitting levels and receiving gains are adjusted in each terminal by variable attenuation pads equipped with calibrated dials. In the first channel the transmitting level has a range from −10 dbm to +10 dbm in 2 db steps. In the second and third channels the maximum transmitting level is increased to +20 dbm and can be varied from 0 in 2 db steps. The receiving gain is selected by a variable attenuation pad calibrated in twenty 1 db steps.

Frequency Selection—The carrier frequencies were selected to conform with nationally accepted standards for allocation of frequencies and direction of transmission. The harmonic relationship of all carrier frequencies was selected to cancel out any possible interference between bands. The equivalent voice frequency band in each channel is approximately 250 to 2750 cycles per second.

Regulated Power Supply—The No. 106 power supply is designed to maintain proper output voltages even though the AC line input voltage varies from 95 Volts to 125 Volts. One power supply has sufficient capacity to serve 3 carrier channels.

Installation Flexibility—The line filters are so designed that the carrier system may be connected *before* or *after* composite sets; thus reducing costly and complicated central office cabling in many cases.

Line Balance—When used on one side of a phantom group, "built-in" line filter balance is provided for the other physical line.

Dial or Ringdown Signalling—The 5U (Universal) signalling unit may be arranged by simple strapping, for dial or ringdown signalling.

APPLICATION

Kellogg Type 5 Transmitted Carrier Systems can be used on wire lines with losses up to 30 db at first channel frequency (10 KC) and up to 41 db loss at second (20 KC) and third (30 KC) channel frequencies. They may be applied to a single physical circuit or one or both side circuits of a phantom or composite group. Any one or all of the 3 channels may be used as desired, so long as the loss at the particular channel frequency does not exceed the prescribed limits stated above.
Measured losses are, of course, more accurate; however, if the necessary measuring equipment is not available, approximate losses may be calculated using the chart and the instructions below.

Your present circuit may be made up of several sections of different kinds of wire or cable, or a combination of both. To calculate line loss at a channel frequency, multiply the loss per mile at 10, 20, or 30 KC (obtained from the chart below) by the length in miles of each section of different kinds of wire or cable; add the losses for each section. It should be noted that this method of calculation does not include possible losses due to impedance mismatches. If the circuit loss does not exceed 30 db at 10 KC or 41 db at 20 or 30 KC, it is within the operating limits of the No. 5 Carrier System. If it exceeds 30 db but is less than 40 db, furnish us with the details of the circuit for study and recommendation.

db LOSSES PER LOOP MILE

CABLE	FREQUENCY (KC)			
	1	10	20	30
16 Gauge Non-Loaded	.73	1.45	1.71	1.93
19 Gauge Non-Loaded	1.08	2.53	2.92	3.16
19 Gauge Carrier-Loaded (C-4.8)	.67	.78	.93	1.37
22 Gauge Non-Loaded	1.79	5.03	6.3	7.2
WIRE Spaced 12" on D. P. Insulators (Wet Weather)				
104 Mil Copper	.077	.121	.172	.215
80 Mil Copper	.13	.17	.20	.24
104 Mil Copper, 40% Conductivity	.16	.197	.212	.224
109 Mill Iron (12 Gauge)	.28	1.11	1.37	2.04

EXAMPLE

CIRCUIT MAKE-UP	LENGTH IN MILES	LOSS IN db AT CARRIER FREQUENCIES					
		Per Loop Mile			Total for Section		
		10KC	20KC	30KC	10KC	20KC	30KC
22 Ga. N.L. Cable	1.8	5.03	6.3	7.2	9.1	11.3	13.0
104 Copper Steel 40%	8.0	.197	.212	.224	1.6	1.7	1.8
19 Ga. N.L. Cable	3.0	2.53	2.92	3.16	7.6	8.8	9.5
104 Copper	15.0	.121	.172	.215	1.8	2.6	3.2
16 Ga. N.L. Cable	1.5	1.45	1.71	1.93	2.2	2.6	2.9
Total for Circuit	29.3				22.3	27.0	30.4

SPECIFICATIONS

FREQUENCY BANDS:		East-West	West-East
	1st channel	8025-10425 CPS	4450- 6850 CPS
	2nd channel	14600-17000 CPS	18750-21150 CPS
	3rd channel	33050-35450 CPS	25900-28300 CPS
SEND LEVEL: Variable-in steps of 2 dbm	1st channel	−10 to +10	
	2nd channel	0 to +20	
	3rd channel	0 to +20	

RECEIVE LEVEL: Variable pad, calibrated in twenty 1 db steps

SIGNALLING:	Type 5-U —	Dial (E & M Lead) or Ringdown
	Type 5-J —	Ringdown only
	CX —	No signalling unit required if simplex or composite leg is available
POWER SUPPLY:	No. 106 —	Regulated, selenium rectifier (No electron tubes used) 95-125 volt 60 cycle input, capacity for 3 channels of carrier with any type signal unit.
	No. 105 —	Non-regulated, 105-125 volt 50-60 cycle input, capacity for 1 channel with type 5-U signal unit or 2 channels with type 5-J signal units.

PLATE VOLTAGE: 200 volts DC **HEATER VOLTAGE:** 6.3 volts AC

DIMENSIONS:

Horizontal: Mounts on standard 19" equipment rack

Vertical: Carrier units	8¾"	Terminal complete with No. 106 Power supply and signalling unit.	
Power Supply units		one channel	21 "
No. 106	5¼"	two channels	33¼"
No. 105	7 "	three channels	45½"
Signal units	3½"		
Line Filter Unit	3½"		

TUBES USED:

Standard Types	Number Used		
	Carrier Unit		Signal Unit
	1st channel	2nd & 3rd channel	
6SL7GT	3	3	1
6SN7GT	3	2	2
6V6GT		1	
OD3/VR150			1

SHIPPING WEIGHT:

Carrier units (per channel)	40 lbs.	Terminal Complete with Power Supply and One Signal Unit Per Channel	
Power Supply (Approx.)	40 lbs.	one channel	120 lbs.
Signal Units (Each)	20 lbs.	two channels	180 lbs.
Line Filter Unit	20 lbs.	three channels	240 lbs.

ORDERING INFORMATION

The code number of Kellogg Transmitted Carrier Systems is composed of four (4) parts as indicated below.

(Part 1)	(Part 2)	(Part 3)	(Part 4)
5	A	—	U
5	B	(E)	J
5	C	(W)	CX

The first part is always the number 5.

The second part indicates the channel.

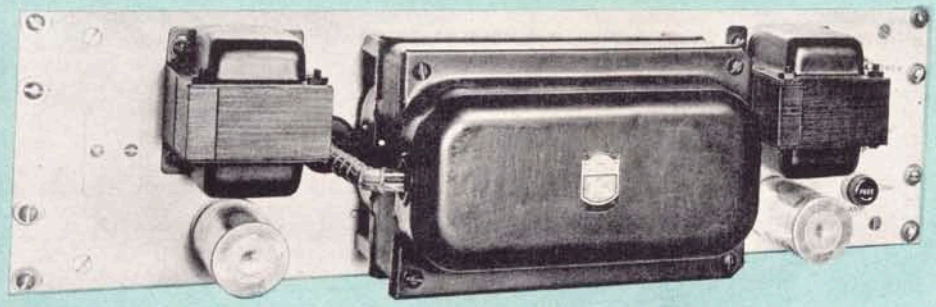
A — First channel
B — Second channel
C — Third channel

The third part is omitted when indicating a system consisting of both east and west terminals, and an E or W in parenthesis is inserted when indicating a single East (E) or West (W) terminal.

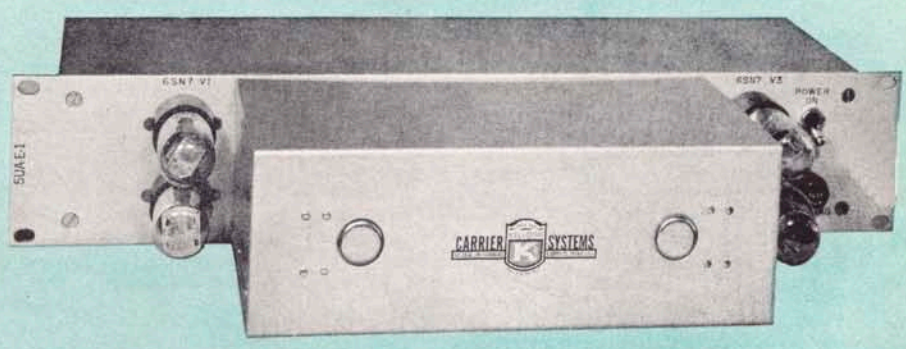
The fourth part indicates the type of signalling.

U — Universal (dial or ringdown)
J — Ringdown only
CX — No signal unit provided (signalling to be accomplished over composite leg.)

For Example: 5A-U indicates the first channel of a system provided with universal (dial or ringdown) signal unit. 5C-(W)-J indicates the third channel, West terminal only, equipped with ringdown signal unit.



106 POWER SUPPLY UNIT



5UA-E-1 SIGNAL UNIT

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